13601 Industrial Parkway
Marysville, Ohio 43040
937-594-3243

August 15, 2008

Mine Safety and Health Administration
Office of Standards, Regulations and Variances
1100 Wilson Boulevard
Room 2350
Arlington, VA 22209-3939

RE: **RIN 1219-AB60**

Dear MSHA:

Veyance Technologies, Inc. (Veyance) very much appreciates the Mine Safety and Health Administration (MSHA) initiating this proceeding on Conveyor Belt Combustion Toxicity and Smoke Density. The opening of this conveyor belt fire safety proceeding, alongside the agency's flame-resistance rulemaking (RIN 1219–AB59), demonstrates the ongoing personal and organizational dedication by MSHA professionals to underground mine safety.

I. Veyance's Commitment

Veyance is committed to **comprehensive** conveyor belt safety. Comprehensive safety in underground coal mines means that strong, mandatory standards are set for: 1) flame-resistance; and 2) smoke density. As part of our commitment to comprehensive conveyor belt safety, Veyance strongly urges MSHA to concurrently mandate flame-resistance and smoke density standards for all conveyor belts used in underground coal mines. Veyance also recommends that MSHA adopt a drum friction test.

II. MSHA's Opportunity

By initiating this proceeding on smoke density and combustion toxicity in conjunction with the flame-resistance rulemaking, MSHA has the opportunity to create a comprehensive conveyor belt fire safety standard. It is only through a comprehensive approach to belt safety that MSHA can fulfill its mission of providing appropriate protection from belt fire hazards to underground miners. As Veyance will document below, a partial approach to conveyor belt fire safety which delays smoke density standards would not provide adequate protection to miners and could even potentially increase certain hazards.

III. <u>Veyance's Approach to Setting Smoke Density Standards</u>

Veyance's extensive research and development work on limiting smoke density and toxicity from overheated conveyor belts is based on:

1. <u>Consensus Standards Testing Methods</u>. All of the tests described below, measure smoke density and the components of smoke toxicity use laboratory-scale, voluntary technical standards developed by recognized standards developing organizations such as the ASTM International (formerly the American Society for Testing and Materials.) All of the standards used by Veyance are already used by federal regulatory agencies for fire safety. Copies of each testing standard are attached as appendixes to these comments.

2. <u>Open Sourcing/Modern Technology</u>. All of the flame retardant compounds Veyance has used in developing low smoke conveyor belts that meet the proposed Belt Evaluation Laboratory Test (BELT) are off-the-shelf compounds available from third-party chemical suppliers. No Veyance-proprietary or Veyance-exclusive compounds were used. Instead, Veyance is taking advantage of "halogen free" flame retardants that are being adopted in various industries around the world.

   As Veyance will explain in Section XI, companies and countries are phasing out halogenated flame retardants in various industries because modern alternatives: 1) produce less smoke; 2) produce less toxic smoke; and 3) are more environmentally friendly.

   While Veyance is not recommending the use of any specific technology, it is clear that MSHA should use revision of the underground conveyor flammability standards as an opportunity to set performance standards that take advantage of the modern, cost-effective technologies available to all manufacturers.

IV. <u>Cost</u>

In its Request for Information (RFI), MSHA asked about the "difference in cost and performance between conventional materials and these new [reduced smoke and toxic combustion product] materials." There is no difference in cost or performance (durability, abrasion resistance, ability to pass a drum friction test, etc.) Low-smoke conveyor belting meeting the BELT is no more expensive than high-smoke belt meeting the same flame resistance standard. Thus, <u>**use of low-smoke BELT-compliant conveyor belts provides additional safety at no additional cost**</u>.

In its flame-resistance rulemaking, MSHA explained that regulatory agencies are required to "assess both the costs and benefits of regulations." It is important that MSHA's cost-benefit analysis recognize that by combining low-smoke and higher flame-resistance requirements, MSHA can achieve significantly higher levels of underground safety without additional cost, a win-win-win situation for miners, mine owners and all other safety stakeholders.

V. Why Low-Smoke Conveyor Belt is Essential to Underground Coal Mine Safety

1. Smoke Causes Multiple Impediments to Mine Escape. Federal research performed by the National Institute of Occupational Safety and Health (NIOSH), based on both controlled experiments and interviews with miners who escaped from underground fires, highlight and document the multiple dangers of smoke and, in specific, the different ways in which smoke hinders the ability of miners to find safety.

   In a controlled experiment measuring "both physiological and psychological response to smoke produced from smoldering wood" in which subjects were "told to thrust the stylus into the holes in a specific order, but trying not to touch the sides of the holes... [researcher] Jin noted that as the smoke density increased, fear of the smoke coupled with irritations of the eyes and throat impeded individuals' ability to concentrate on the task of operating the steadiness tester."[1]

   Based on interviews with mine fire survivors, NIOSH noted that "individuals who escaped the mine fires reported visibility distances that were often far below those calculated from Jin's results."[2] A miner is quoted as saying, "The [stopping] was probably on the other side of these props, but I couldn't see it. I couldn't even see the door, that's how thick it was. I put my hands out...and I couldn't see the end of my fingers."[3]

   Another miner recounted how "I walked up there to the overcast and I stepped right into it. And it was like a black wall. It was like burning 50 tires and trying to walk through it...and I said, 'We can't go that way.' So we walked out and there was some—I know there was doors in those overcasts. I said, 'The intake's here someplace. All we've got to do is find it.' And you'd open up the door and it'd just billow out; and you'd open another door and it would billow out...we opened up [one] door, it looked like it was a black river running by. That's how thick it was."

   NIOSH explained that at "Brownfield Mine, the smoke was so heavy that a foreman actually walked into the belt structure while attempting to make his way to the other side of 6 West mains to check for fresh air in the No. 7 intake."[4]

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[1] C. Vaught, Ph.D., M. J. Brnich, Jr., L. G. Mallett, Ph.D., H. P. Cole, Ed.D., W. J. Wiehagen, R. S. Conti, K. M. Kowalski, Ph.D., and C. D. Litton, "Behavioral and Organizational Dimensions of Underground Mine Fires," US Department of Health and Human Services, National Institute for Occupational Safety and Health Pittsburgh Research Laboratory, May 2000, p. 118. [Emphasis added.]

[2] Ibid., p. 122.

[3] Ibid. pp. 121-122.

[4] Ibid., p. 122.

The NIOSH study documents that the psychological effects of heavy smoke harmed the ability of miners to perform basic survival tasks, such as donning SCSRs. The study quotes a wireman who had been in the 7 Butt section of Cokedale Mine as saying, "We were in the jeep, and we hit smoke. I got all scared you know, all, what the hell we going to do, you know, all this smoke...And I was on the jeep, and [the boss] said, 'Get your SCSRs on.' And I...opened mine up and I was like shakin' like a leaf, couldn't get the damn thing open. And [the boss]...said, 'Here, pop this, stick this in your mouth...' I mean, I couldn't get the damned thing, I was so damned scared I didn't know what else, I didn't know what the hell to do, you know."[5]

NIOSH also explained that "Apprehension about the smoke caused one of the shuttle car operators at Adelaide Mine to experience difficulty breathing, even though he was wearing an SCSR and was protected from the smoke." The miner recounted that "We went into that smoke and I couldn't breathe and was gagging on that self-rescuer. I couldn't breathe any at all...I couldn't go in [that smoke]. I guess it may be psychological or something about being in that smoke or something. I couldn't breathe at all. In [the smoke] I was gagging but as soon as I would come out of there, it seemed like I was breathing better, a little bit better."[6]

The result of even a single miner being overwhelmed by smoke can endanger many others as they attempt to rescue their co-worker. "Because of his experience, the shuttle car operator chose not to follow his buddies into the heavy smoke at the overcast. Instead, recognizing where he was, he decided to follow another route that led him across 2 Northwest Mains and down the right-side return escapeway to a point outby the fire. This decision is significant because several of the miner's buddies, believing him to be lost, risked their lives by going back to the overcast to look for him after everyone had reached safety."[7]

The critical hazards to miners from thick smoke goes beyond visual loss, respiratory irritation, and anxiety effects. NIOSH states that "While some miners became afraid in the smoke, others became confused and disoriented. This inhibited some miners' ability to think clearly and respond functionally to the situation. The Federal mine inspector, who escaped from 4 South at Brownfield Mine, had conducted numerous inspections in the sections off 6 West Mains and was moderately familiar with the layout of that portion of the mine. Nevertheless, he reported becoming disoriented and confused in the heavy smoke, especially toward the end of his ordeal as he made his way from the belt entry to the track."[8]

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[5] Ibid, pp. 124-125.

[6] Ibid, p. 125.

[7] Ibid.

[8] Ibid.

NIOSH summarized that "It is evident from these accounts that miners experienced great emotional trauma while escaping through the smoke-filled passageways. In some cases, miners' ability to concentrate, make informed choices, and take appropriate actions during their escape was severely hampered by the need to deal with emotional effects of the smoke."[9]

In addition to the effects of visually obstructive smoke, NIOSH recognized the other escape difficulties resulting from the irritant compounds in the smoke, a crucial factor in the this proceeding and the flame-resistance rulemaking since, as we will document below, unless controlled, the concentration of smoke irritants such as HCl will increase as more flame retardants are used to meet the proposed BELT standard. As NIOSH noted, "Besides having to cope with the psychological effects of smoke in their escape environment, many miners had to contend with physiological elements as well. Smoke clouds carry CO as well as sensory irritants, both of which are byproducts of combustion."[10]

It is crucial to note that NIOSH has recognized the potential hazards from chlorinated flame retardants commonly used to increase flame-resistance. As NIOSH stated, "Depending on the material burning, other toxic and irritating elements can be produced. For conveyor belts, in particular, the generation of HCl vapor due to chlorine in the belt, as either a component of the base polymer or as an additive to make the belt more flame-resistant, is an example of such an irritant and also represents a potential toxic hazard in addition to the CO produced."[11]

It should be noted that a Canadian state safety agency recognized the potentially lethal danger in mine fires of gases other than CO. The Saskatchewan Labour Occupational Safety and Health Division explained that "About 10 percent of all fire deaths are unexplained by carbon monoxide poisoning or other clear causes. They include deaths with signs and symptoms of respiratory tract irritants. Such irritants prevent proper breathing (i.e. choking, suffocation) and impede escape, thus increasing exposure to asphyxiants such as carbon monoxide and hydrogen cyanide."[12]

While recognizing the potential dangers from toxins, NIOSH also focuses on smoke as the most severe hazard to miners. Specifically, "the presence of smoke poses a more

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[9] Ibid., p. 127.

[10] Ibid.

[11] Ibid., p. 130. [Emphasis added.]

[12] "Saskatchewan Mine Emergency Response Program: Mine Rescue Manual," February 2001, p. 68.

severe impediment to survivability and eventual escape from fire than the toxicity of the gases produced."

The NIOSH research also examined the physiological problems experienced by miners in smoke including those miners with functioning SCSRs, "It is understandable why miners experienced emotional instability during their escape through smoke from these fires. However, one might question why more than one-third experienced physiological problems since miners would have been offered respiratory protection from either their SCSR or FSR and eye protection from the goggles contained in their SCSR. These problems are easily explained: besides removing the mouthpiece to breathe, as mentioned earlier, nearly 48% of the miners who escaped also took the mouthpiece out in smoke to talk. Subsequently, miners inhaled smoke and various contaminants which caused them to experience breathing discomfort. The interviews also revealed that few miners wore the goggles supplied with their SCSR to protect their eyes. Many of the miners said that the goggles fogged quickly and hampered their vision. As a result, more than 63% of the escaping miners said they did not wear the goggles for that reason."[13] Thus, while functioning SCSRs and training in their proper use are essential elements of underground safety, they are not a substitute for low-smoke conveyor belting.

The NIOSH study also noted that miners were confronted with heavy smoke where it was not expected. For example, a miner explained that "We started down the belt because we figured the belt should have been neutral, really, but by the time we got there, the smoke was already on the belt line...we still can't figure out how the smoke got on the belt. Nobody—our boss can't figure out how the smoke got on the belt line. We should have been able to go down and get out the belt."[14]

A mine inspector who escaped from 4 South at Brownfield Mine hypothesized but could not be sure why the belt entry became smoke-filled, "To this day we really didn't conclusively come up with an answer why that belt got contaminated. We checked the [stoppings]. I understand [stoppings] do leak somewhat but not to go from no smoke to thick heavy smoke in a matter of minutes. [Stoppings] don't leak that much. Someone left the doors open into that belt, also. I believe it."[15]

2. Smoldering Belts. All conveyor belts, irrespective of materials used, will give off smoke and toxic gasses when they are overheated, even if there is no fire. Veyance test results demonstrate that smoldering belts can give off thick, black smoke (detailed below) without any flame. The Bureau of Mines recognized years ago, with respect to

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13 "Behavioral and Organizational Dimensions of Underground Mine Fires," p. 132.

14 Ibid., p. 135.

15 Ibid.

conveyor belts and other mine materials, that the "principal hazards encountered in smoldering combustion involve toxic gas and smoke production."[16]

3. Flame-Resistant Does **NOT** Mean Fire-Proof. The proposed BELT standard would increase the minimum level of flame resistance for conveyor belts but does not mean that the belt would be fire-proof – no belt or other material can ever be considered as fire proof. The BELT protocol calls for gas jets to be applied to one end of a five foot sample of conveyor belting. The sample passes if any portion of the sample remains undamaged. Thus, fire can consume almost the entire length of test sample and the belt still passes the test.

Since federal safety officials have extensively documented the multi-level hazards smoke presents to miners attempting to escape, and as detailed below, the proposed BELT standard has the potential to lead to even thicker smoke, *how could MSHA not speedily implement low-smoke density belt standards concurrent with the flame resistance rule?*

VI. The Technical Study Panel Expressed Concerns About Smoke

Although the charter for the Technical Study Panel (TSP) created by the MINER Act did not specify discussion of smoke and toxic fume issues, panel members expressed serious concerns about smoke toxicity. For example,

> "DR. WEEKS: ... Just by way of clarification, but toxicity you were talking about the toxicity of smoke from belt fires?
>
> DR. CALIZAYA: Yes.
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> DR. WEEKS: No. We didn't address that.
>
> DR. CALIZAYA: Well, regarding this point I think at least to me based on the hearings we had before we should address that point of toxicity.
>
> We know that it's the fumes that will cause any accidental death that we may have in mines. If we have toxic fumes then definitely we are allowing that to take place."[17]
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> ***
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> DR. WEEKS: Well, no other word changes, but, Jerry, did you have some more to say about the toxicity of smoke? I don't want to let this issue just get shoved under the rug.
>
> DR. TIEN: Yes, but obviously we are."

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[16] U.S. Department of Interior, Bureau of Mines, Information Circular 9272, "Summary of Combustion Products From Mine Materials: Their Relevance to Mine Fire Detection," p. 7.

[17] Transcript of Proceedings, Technical Study Panel meeting, September 17, 2007, p . 40, pp. 47-48.

VII. Congress Calls for Smoke Safety Regulations

In the S-MINER Act (H.R. 2768) which passed the House of Representatives on January 16, 2008, Congress explicitly called for MSHA to adopt smoke density and toxicity regulations. Specifically, the legislation stated, "''Not later than 90 days after the date of enactment of the S–MINER Act, the Secretary shall publish interim final rules to revise the requirements for flame resistant conveyor belts to ensure that they meet the most recent recommendations from the National Institute for Occupational Safety and Health, **and** to ensure such belts are designed to limit smoke and toxic emissions." [Emphasis added.]

The Report language accompanying the legislation made clear that the purposed of the legislative language was to provide both smoke density and toxic gas limitations, in addition to the NIOSH-recommended BELT, in order to protect lives by reducing risks associated with the elements of fire safety; flame-resistance, smoke density, and smoke toxicity.

Specifically, the Report stated,

> "The mandate and recommendations of the Technical Review Panel were confined to flame resistance. Since it began work, however, both the Panel and the Committee has been advised that belt fabric is currently available which meets not only the NIOSH flame resistance standard but which also can reduce the smoke and toxic emissions that actually lead to death in the closed environment of underground mines. Accordingly, the reported bill requires the use of belt material which can simultaneously reduce all three risks. In this sense, the reported bill is consistent with the recommendations of the Technical Review Panel but expands upon them to provide additional protections."[18]

VIII. Smoke Density and Combustion Toxicity Test Results

Veyance has conducted extensive research on the smoke density and smoke toxicity of current conveyor belt samples as well as conveyor belt that is BELT-compliant. As the data below demonstrates, using off-the-shelf flame retardants, Veyance is able to meet the proposed BELT test while substantially reducing smoke density and smoke toxicity below current levels. Veyance's research has also shown, however, that unless specifically controlled, both smoke density and smoke toxicity of BELT-compliant belting can sharply increase over current levels presenting new hazards to miners.

Veyance below is presenting: 1) smoke density data using ASTM E662; and 2) smoke toxicity data, measured in parts-per-million using Boeing Specification Support Standard BSS 7239.

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[18] House of Representatives, 110th Congress, 1st Session, Report 110-457, Supplemental Mine Improvement and New Emergency Response Act of 2007, p. 58.

VEYANCE TECHNOLOGIES

The data is presented for three types of conveyor belts, 1) current 2G belting; 2) BELT-compliant belts using conventional halogenated flame retardants; and 3) smoke-controlled, BELT-compliant belts. Comparative tables are presented in Section D.

A. Current "2g" Conveyor Belts

1. Smoke Density (measured per ASTM E662)

Smoldering (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Current 2G compliant	2	73

Flaming (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Current 2G compliant	65	195

Ds is the calculated specific optical density as measured by ASTM E662, the test standard is attached.

2. Smoke Toxicity (measured per Boeing Specification Support Standard BSS 7239)

a. HCl

	ppm - Smoldering	ppm - Flaming
Current 2G compliant	500	500

b. CO

	ppm - Smoldering	ppm - Flaming
Current 2G compliant	50	500

c. HCN

	ppm - Smoldering	ppm - Flaming
Current 2G compliant	<2	<2

d. NO_x

	ppm - Smoldering	ppm - Flaming
Current 2G compliant	<2	5

B. Conventional Halogenated BELT-Compliant Conveyor Belts

1. Smoke Density (measured per ASTM E662)

Smoldering (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Halogenated BELT-Compliant	6	125

Flaming (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Halogenated BELT-Compliant	144	389

Ds is the calculated specific optical density as measured by ASTM E662, the test standard is attached.

2. Smoke Toxicity (measured per Boeing Specification Support Standard BSS 7239)

a. HCl

	ppm - Smoldering	ppm - Flaming
Halogenated BELT-Compliant	1,000	1,500

b. CO

	ppm - Smoldering	ppm - Flaming
Halogenated BELT-Compliant	50	500

c. HCN

	ppm - Smoldering	ppm - Flaming
Halogenated BELT-Compliant	<2	2

d. NO_x

	ppm - Smoldering	ppm - Flaming
Halogenated BELT-Compliant	<2	<2

C. **Smoke-Controlled BELT-Compliant Conveyor Belts**

1. **Smoke Density (measured per ASTM E662)**

Smoldering (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Smoke-Controlled BELT-Compliant	1	15

Flaming (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Smoke-Controlled BELT-Compliant	4	28

Ds is the calculated specific optical density as measured by ASTM E662, the test standard is attached.

2. **Smoke Toxicity (measured per Boeing Specification Support Standard BSS 7239)**

a. HCl

	ppm - Smoldering	ppm - Flaming
Smoke-Controlled BELT-Compliant	6	25

b. CO

	ppm - Smoldering	ppm - Flaming
Smoke-Controlled BELT-Compliant	10	200

c. HCN

	ppm - Smoldering	ppm - Flaming
Smoke-Controlled BELT-Compliant	<2	2

d. NO_x

	ppm - Smoldering	ppm - Flaming
Smoke-Controlled BELT-Compliant	<2	10

D. Summary Comparison of Current, Halogenated and Smoke-Controlled Belts

1. Smoke Density (measured per ASTM E662)

Smoldering (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Current 2G compliant	2	73
Halogenated BELT-Compliant	6	125
Smoke-Controlled BELT-Compliant	1	15

Flaming (avg. of 3 tests)

	Ds @ 90 sec.	Ds @ 4 min.
Current 2G compliant	65	195
Halogenated BELT-Compliant	144	389
Smoke-Controlled BELT-Compliant	4	28

Ds is the calculated specific optical density as measured by ASTM E662, the test standard is attached.

2. **Smoke Toxicity (measured per Boeing Specification Support Standard BSS 7239)**

Smoldering

	HCL	CO	HCN	NO_x
Current 2G compliant	500	50	<2	<2
Halogenated BELT-Compliant	500	10	<2	<2
Smoke-Controlled BELT-Compliant	6	10	<2	<2

Flaming

	HCL	CO	HCN	NO_x
Current 2G compliant	500	500	<2	5
Halogenated BELT-Compliant	1,500	500	2	<2
Smoke-Controlled BELT-Compliant	25	200	2	10

E. Test Conclusions

- Increasing conveyor belt flame-retardant quantities to meet the proposed BELT test has the potential to substantially increase the density and toxicity of smoke given off in both smoldering and burning (passing the BELT does **not** mean that the belting is fire proof) conditions.
- When controlling smoke through widely available, cost-competitive flame retardants, smoke can be reduced well below current levels while still meeting the proposed BELT flame resistance standard.
- To ensure that underground miners are afforded improved safety, MSHA needs to specifically mandate limits on: 1) flame-resistance; and 2) smoke density.

IX. Test Methodologies Used by Veyance and Federal Agencies

All of the tests discussed above, were conducted using laboratory-scale consensus standard methodologies that are also used by federal agencies.

1. **ASTM E662**

ASTM E662 is a very widely used standard test to measure the optical density of smoke A copy of the ASTM E662 standard is attached as Appendix A of these comments.

Fire safety regulations using ASTM E662 have already been established by the Department of Transportation's Federal Railroad Administration.[19] The Federal Aviation Administration also uses a similar ASTM smoke density testing standard (with a slight variation on the sample holder) for cabin materials in commercial aircraft.

It should be noted that ASTM E662 is very similar to the National Fire Protection Association's standard NFPA 258. NFPA has explained that they recommended that NFPA 258 be withdrawn because: 1) of the widespread regulatory use of ASTM E662; and 2) unlike the ASTM standard, the NFPA standard lacked enforceable language.

As NFPA explained, "In its current form NFPA 258 cannot be used as a mandatory reference. ASTM E662 is similar to NFPA 258 and is referenced in numerous regulator documents. NFPA 258 includes the caveat that it is for research purposes only and it is written as a Recommended Practice without enforceable language. In light of current harmonization efforts regarding fire test standards with ASTM and UL, the committee finds no compelling reason to revise NFPA 258 into a standard particularly when a similar test method maintained by ASTM currently exits."[20]

In discussing the use of E662 and other standard fire safety tests by the Navy, the National Academy of Sciences (NAS) made a crucial point that corroborates Veyance's fundamental approach to underground fire safety – no single test is adequate for evaluating the fire hazards associated with any material. As the NAS explained, "No single metric, and hence no one test method, is adequate to completely evaluate the fire hazard of a particular material system. For example, the testing procedure for evaluating composite material systems for naval submarine interiors (DOD, 1991) includes oxygen-temperature index, flame spread (ASTM E-162), ignitability (ASTM E-1354), heat release (ASTM E-1354), smoke obscuration (ASTM E-662), combustion gas generation (ASTM E-1354), and toxicity (N-gas method)."[21]

Veyance strongly recommends that MSHA accept the long-standing recognition by the Department of Transportation, Department of Defense, and the National Academy of Sciences—no single test can adequately measure for the fire protection

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[19] 67 Fed Reg 42911, June 25, 2002.

[20] NFPA, Report on Proposals A2006, found at http://www.nfpa.org/assets/files/PDF/ROP/258-A2006-ROP.pdf. [Emphasis added.]

[21] National Materials Advisory Board, the National Academies, "Fire- and Smoke-Resistant Interior Materials for Commercial Transport Aircraft," 1995, p. 27.

needed to protect human lives, multiple tests are needed to measure the different aspects of a material's fire safety characteristics including flame-resistance and smoke toxicity. It is only by adopting smoke density regulations, based one existing Department of Transportation standards, along with flame-resistance standards, that MSHA will be able to provide appropriate protection to underground miners.

2. **BSS 7239**

Boeing Specification Support Standard BSS 7239 is standard methodology for measuring the toxic compounds in smoke. A copy of BSS 7239 is attached to these comments as Appendix B.

The Federal Aviation Administration references BSS 7239 in their Aircraft Materials Fire Test Handbook.[22]

3. **ASTM E1354**

ASTM 1354 is a standard testing methodology for measuring smoke and heat release from materials using a frequently-used laboratory testing device called a "cone calorimeter." A copy of ASTM E1354 is attached to these comments as Appendix C.

NASA makes use of the ASTM E1354 standard in their procurement requirements.[23] The Nuclear Regulatory Commission described the standard as the "most common method to measure HRR [Heat Release Rate]."[24]

X. Other Uses of Smoke Toxicity and Density Safety Regulations: Airbus

Twenty-five years ago, the European aircraft manufacturer Airbus established, based on US Federal Aviation Administration requirements, requirements for both smoke density and smoke toxicity. Since then, Airbus has strengthened their requirements to protect passengers from smoke and fumes, as well as flames, in event of an accident.

As Airbus explains, "In 1979 Airbus established the ATS 1000.001 (Airbus Test Specification) representing an extended in-house version of the FAA regulations with regard to smoke and toxicity requirements. ... In 1994 the ATS 1000.001 was superseded by the ABD 0031. The

[22] http://www.fire.tc.faa.gov/pdf/handbook/00-12_apE.pdf.

[23] http://standards.gov/sibr/query/index.cfm?fuseaction=Home.procurement_sibr_by_keyword&Keyword_Input=e1354&CFID=16403332&CFTOKEN=52cd976356d1b8fe-A4336247-F2AD-EE93-E413BA0BFE97124A&jsessionid=b4303544fb29b3a211f1

[24] Fire Dynamics Tools (FDT^s) Quantitative Fire Hazard Analysis Methods for the U.S. Nuclear Regulatory Commission Fire Protection Inspection Program (NUREG-1805, Final Report), p. 3-3.

ABD 0031 represents an increased FST standard such as more severe smoke emission limits for all non-metallic interior components."[25]

XI. The Phase-Out of Halogenated Materials

Companies in Europe and the US are phasing-out or have already eliminated the use halogenated materials for flame retardant purposes because modern alternatives result in less hazardous smoke (density and toxicity) and halogen-free fire retardants are more environmentally friendly.

The European Union, in a 2000 decision regarding the proposed merger of two companies producing materials used in flame retardants, summarized the smoke density, smoke toxicity and environmental concerns regarding halogenated flame retardants, "There is another category of alternative flame-retardant substances for the above applications, namely, halogenated flame retardants. Halogenated substances may be efficient flame retardants; however, they are toxic and generate more smoke than inorganic flame retardants. Because of growing environmental concerns — which are expected to lead to the phasing-out of those substances — halogenated phosphorous substances are being replaced by inorganic flame retardants... "[26]

A European Union official in 2006 discussing a "*Draft Commission Decision regarding the Classification of the Reaction to Fire Performance of Construction Products,*" before a World Trade Organization Committee, explained that "member States would be allowed to require for certain works the use of electric cables belonging to a so called "low smoke/low/zero halogen" family which would prevent incapacitating effects to occupants allowing them therefore enough time to escape in case of fire and the spread of toxic gases." [27]

A recent trade magazine article discussing the global shift to halogen-free flame retardants noted that "Two key compliance areas for additives have been... and growth of halogen-free flame retardant (HFFR) systems. Revisions made in 2006 to the EU's Construction Products Directive (CPD) raise EU fire safety standards and change the regulatory focus to a product performance target. The CPD revisions are expected to drive use of HFFR with better flame retardant performance..." The article also explains that "Regulatory concerns and pressure from non-governmental organizations (NGOs) are driving a move to halogen-free flame retardants (HFFR), say suppliers. In building and construction, Europe has already switched mainly to HFFR constructions... China and India are also

[25] Theo Klems, Airbus S.A.S., UP–DATE ON AIRBUS FIRE SAFETY RESEARCH AND DEVELOPMENT, found at http://www.fire.tc.faa.gov/2004Conference/files/fire/T.Klems_Airbus_Fire_Safety_R&D.pdf.

[26] Official Journal of the European Communities, Commission Decision of 14 March 2000, found at http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:090:0001:0022:EN:PDF, para. 19. {Emphasis added.]

[27] World Trade Organization, Committee on Technical Barriers to Trade, Minutes of Meeting of 15 and 17 March 2006, para 21, found at http://trade.ec.europa.eu/doclib/docs/2008/january/tradoc_137570.pdf

converting to low-smoke, zero halogen (LS0H) formulations, say experts. ... Low smoke generation is a global concern, particularly in building and construction applications."[28]

Specific standardized test methods used in Europe with respect to wire and cable include prEN 50399-2-1 and prEN 50399-2-2 "Common test methods for cables under fire conditions – Heat release and smoke production measurement on cables during flame spread test" Other test standards include "EN 61034-2 Measurement of smoke density of cables burning under defined conditions" and "ISO 5660 Reaction-to-fire tests – Heat release, smoke production and mass loss rate."

Among American companies, Intel has announced that the company "is introducing halogen-free packaging technology for its processor and chipset products starting in 2008, and will convert most of its 45nm processor and 65nm chipset products to halogen-free packaging technology by the end of 2008."[29] Intel also announced a symposium earlier this year in partnership with IPC/Association Connecting Electronics Industries, as part of "Intel's effort to eliminate halogenated fire retardants from our product packaging as part of a broader strategy to support an environmentally sustainable future…."[30] The significance of the computer industries announcement is to underscore that halogenated flame retardants are being replaced in diverse industries.

Veyance Conclusions

1. No single test methodology is adequate for measuring all three critical elements of fire safety needed to protect the safety of underground miners. Instead separate standards are needed for:

    A. Flame-resistance; and

    B. Smoke density.

2. Non-proprietary materials are currently available which allow conveyor belts to meet the NIOSH-recommended BELT flame-resistance standard while simultaneously reducing smoke toxicity and smoke density below current levels.

    -- Belts made with non-halogenated low-smoke flame retardants have similar durability and other performance criteria to belts made with high-smoke halogenated materials.

    -- Belts made with non-halogenated low-smoke flame retardants are able to pass drum friction tests.

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[28] Plastics Additives & Compounding, "Regulatory issues drive developments in wire and cable," *July/August 2007, pp. 32-33.*

[29] http://www.intel.com/technology/silicon/leadfreetech/overview.htm.

[30] http://www.pcb007.com/anm/templates/article.aspx?articleid=17309&zoneid=77&v=.

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3. Low-smoke BELT-compliant conveyor belts cost no more than high-smoke BELT-compliant conveyor belts.

Veyance Recommendation

MSHA should quickly and simultaneously adopt regulations controlling conveyor flame-resistance and smoke density. MSHA should also adopt a drum friction test on a speedy basis.

Sincerely,

Terry Graber
Global Technical Manager, HW Conveyor Belt
Veyance Technologies, Inc.
08-15-08

Dave Maguire
Vice President, Global Technology
Veyance Technologies, Inc.
08-15-'08